

## NEW SUPRAORDINAL NAMES AND RECOGNITION OF FIVE CLASSES IN MAGNOLIOPHYTA

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### ABSTRACT

The flowering plants are divided into five rather than two classes, Magnoliopsida, Piperopsida, Liliopsida, Ranunculopsida, and Rosopsida, corresponding to the magnolioides, the paleoherbs, the monocots, the ranunculids, and the eudicots. The subclasses **Piperidae** and **Cornidae**, and the superorders **Piperanae**, **Capparanae**, **Cucurbitanae**, and **Saxifraganae** are proposed as new. A brief linear sequence of the higher taxa (above the rank of superorder) is presented for the flowering plants.

**KEY WORDS:** Magnoliophyta, Magnoliopsida, Piperopsida, Liliopsida, Ranunculopsida, Rosopsida, Piperidae, Cornidae, Piperanae, Capparanae, Cucurbitanae, Saxifraganae, classification, phylogeny

Ongoing research detailing the relationships among various families of angiospermous plants (Magnoliophyta) is demonstrating the need for changes in the established system of classification (Cronquist 1981, 1988; Takhtajan 1987; Thorne 1992a, b) above the rank of order. Most of these recent efforts (Crane 1985; Chase *et al.* 1993; Doyle & Donoghue 1986, 1992; Donoghue & Doyle 1989; Loconte & Stevenson 1991; Qui *et al.* 1993) have shown that the traditional dicotyledonous group (Magnoliopsida) is not a monophyletic taxon although the monocotyledonous group (Liliopsida) is. To provide a workable nomenclature for a classification reflective of the major higher taxonomic trends within the flowering plants, namely the magnolioides, the paleoherbs, the ranunculids, the eudicots, and the monocots, it is suggested that each be recognized at the rank of class within Magnoliophyta as defined by Cronquist *et al.* (1966).

The use of names at a single rank for nested groups within a single taxon (Magnoliophyta) is a problem because not all members of the nested groups can be distinguished and the loss of phylogenetic information is exacerbated because the relationships of the nesting patterns are not expressed by single-rank names. The limitations of existing nomenclature preclude the recognition of numerous nested groups at different ranks as it is unrealistic to proliferate ranks to account for all the potentially recognizable groups. By using the rank of class for the five groups of flowering plants distinguished here one can at least recognize the major trends within Magnoliophyta, albeit with some still para-monophyletic. As for the formal taxonomic recognition of the unique groups for *Ceratophyllum* (a dicot: Loconte & Stevenson 1991; Chase *et al.* 1993) and for *Acorus* (a monocot: Duvall *et al.* 1993a, b), as distinct from the remainder of the dicots or monocots, I do not consider this worthy for nomenclatural and taxonomic reasons. Much remains to be done to confirm that these genera represent unique groups and that they are the most primitive of our modern dicots and monocots, respectively.

The following linear sequence attempts to outline a system of classification for the flowering plants above the rank of superorder. Several superorders beyond those noted below remain to be published and until those names are available, a more detailed presentation is not appended. It should be noted that while such subclasses as Hamamelididae and Dillenidae are retained, their definitions differ greatly from the Cronquistian circumscriptions.

Magnoliophyta Cronq., Takht., & Zimmerm., *Taxon* 15:134. 1966.

A. Magnoliopsida Brongn., *Enum. Pl. Mus. Paris* xxvi, 95. 1843.

1. Magnoliidae Novák *ex* Takht., *Syst. Phylog. Magnolioph.* 51. 1967.

B. Piperopsida Bartl., *Ord. Nat. Pl.* 83. 1830.

2. Piperidae Reveal, *Phytologia* 76:3. 1994.

C. Liliopsida Batsch, *Regni Veg.* 108. 1802.

3. Alismatidae Takht., *Syst. Phylog. Magnolioph.* 461. 1967.

4. Triurididae Takht. *ex* Reveal, *Novon* 2:235. 1992.

5. Arecidae Takht., *Syst. Phylog. Magnolioph.* 425. 1967.

6. Liliidae Takht., *Syst. Phylog. Magnolioph.* 473. 1967.

7. Commelinidae Takht., *Syst. Phylog. Magnolioph.* 514. 1967.

8. Zingiberidae Cronq., *Brittonia* 30:505. 1978.

D. Ranunculopsida Brongn., *Enum. Pl. Mus. Paris* xxvi, 96. 1843.

9. Ranunculidae Takht. *ex* Reveal, *Novon* 2:235. 1992.

E. Rosopsida Batsch, *Regni Veg.* 1. 1802.

10. Caryophyllidae Takht., *Syst. Phylog. Magnolioph.* 144. 1967.
11. Hamamelididae Takht., *Syst. Phylog. Magnolioph.* 113. 1967.
12. Dilleniidae Takht. *ex* Reveal & Takht., *Phytologia* 74:171. 1993.
13. Rosidae Takht., *Syst. Phylog. Magnolioph.* 264. 1967.
14. Cornidae Frohne & Jensen *ex* Reveal, *Phytologia* 76:4. 1994.
15. Lamiidae Takht. *ex* Reveal, *Novon* 2:235. 1992.
16. Asteridae Takht., *Syst. Phylog. Magnolioph.* 405. 1967.

The following new names are required within Magnoliophyta.

**Piperidae** Reveal, *subcl. nov.*, validated by the Latin description associated with Piperopsida Bartl., *Ord. Nat. Pl.* 83. 1830 (as "Piperinae").

**Piperanae** Reveal, *superord. nov.*, validated by the Latin description associated with Piperopsida Bartl., *Ord. Nat. Pl.* 83. 1830 (as "Piperinae").

By adopting Piperopsida for the paleoherbs it becomes necessary to propose a name at the rank of class, and because the rank of superorder is now widely used (Takhtajan 1987; Dahlgren 1989a, b; Thorne 1992a, b; Reveal 1993)—albeit not recognized formally by the *Code* (Greuter *et al.* 1988), one at the rank of superorder is required as well. As defined here, Piperanae consists of three orders, Aristolochiales, Piperales, and Lactoridales, and four families Aristolochiaceae, Saururaceae, Piperaceae, and Lactoridaceae (Tucker *et al.* 1993). Chloranthaceae is referred to the Chloranthales and placed in Magnoliopsida near Amborellaceae and Trimeniaceae in Illiciales (Endress 1987). The inclusion of Lactoridaceae is supported by their specialized flowers, but their anatropous ovules and follicular fruits are more typical of Magnoliales. The ultimate fate of this family remains to be ascertained.

**Capparanae** Reveal, *superord. nov.*, validated by the Latin description associated with Order Capnanthemae Batsch, *Regni Veg.* 84. 1802, *nom. illeg.*

Takhtajan (1987) and Thorne (1992a, b) include Capparales within Violanae, but evidence presented by Chase *et al.* (1993) shows the Capparales well removed from Violales. By placing Caricaceae in Caricales and associating that order with the Capparales, as suggested by Rodman *et al.* (1993), the two groups become sufficiently distinct to require the recognition of a

new superorder. As here defined, the superorder includes Salvadorales (Salvadoraceae), Moringales (Moringaceae), Caricales (Caricaceae), Limnanthales (Limnanthaceae), Batales (Bataceae), Capparales (Pentadiplandraceae, Tovariaceae, Resedaceae, Capparaceae, Brassicaceae) and Elaeocarpaceae (Elaeocarpaceae). The family Gyrostemonaceae is also a member of the taxon, but the ordinal name remains to be validated.

**Cucurbitanae** Reveal, *superord. nov.*, validated by the Latin description associated with Order Cirrhatae Batsch, *Regni Veg.* 220. 1802, *nom. illeg.*

The placement of Cucurbitales and its relatives is debatable. Cronquist (1981) and Thorne (1992a, b) retain the taxon in Violales while Takhtajan (1987) keeps the order in Violanae. The core membership of the group associated with Cucurbitaceae includes Datisceae and Begoniaceae, and Chase *et al.* (1993) have shown, based on *rbcL* data, that these families are not that closely related to Violales. In addition to the above three families (or four if one accepts Tetramelaceae), I have placed Coriariaceae in Cucurbitanae (in Coriariales), albeit provisionally, but well removed from the Ranunculales where placed by Cronquist (1981) and therefore closer to Rutanae (or Sapindanae) where aligned by Takhtajan and Thorne. The basis for this association is the preliminary data provided by Chase *et al.*

**Saxifraganae** Reveal, *superord. nov.*, validated by the Latin description associated with Class Corniculatae Endl., *Gen. Pl.* 808. 1839, *nom. illeg.*

The isolation of the Saxifragales from Rosales demonstrated by Morgan & Soltis (1993) also demands recognition of a separate superorder, distinct from Celastranae, well removed from Rosanae, and situated more or less basally in Rosidae. Brexiales and Parnassiales are referred to Celastranae, with Hydrangeales to Cornanae. As here defined, Saxifraganae consists of a series of orders (some not yet validated) which include such families as Greyiaceae, Francoaceae, Crassulaceae, and Grossulariaceae. With the exception of Crossosomataceae, which is here tentatively included in Saxifraganae, all of these families are clearly related to Saxifragaceae.

**Cornidae** Frohne & Jensen *ex* Reveal, *subcl. nov.*, validated by the Latin description associated with Order Umbraculariae Batsch, *Regni Veg.* 40. 1802, *nom. illeg.*

The work published by Chase *et al.* (1993) and Xiang *et al.* (1993) shows Cornanae to constitute a group distinct from both Rosidae (where Hydrangeales and Cornales have traditionally been placed) and Asteridae (where the Caprifoliales are typically assigned). As here defined, the subclass is composed of two superorders, Cornanae and Araliaanae. The former is composed of four orders (Garryales, Aralidiales, Cornales, and Hydrangeales), the latter of six orders (Toricelliales, Pittosporales, Byblidales, Araliales, Viburnales, and Dip-sacales). Frohne & Jensen (1985, 1992) include Gentiananae in Cornidae, but this taxon is retained in Lamiidae.

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